



# Stormwater 201- Billing

Satellite Imagery:

A Crucial Resource in Stormwater Billing



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- **Overview of QuickBird Satellite**
- **City of Durham Stormwater Billing System Residential Tier Schedule**
- **Impervious Area Data Maintenance**
- **Evaluation of Satellite Derived Impervious Area**
- **Summary and Conclusions**

# Outline





- QuickBird is a high-resolution commercial earth observation satellite, owned by DigitalGlobe and launched in 2001.
- QuickBird collects the highest resolution commercial imagery of Earth, and boasts the largest image size and the greatest on-board storage capacity of any satellite.
- The satellite collects panchromatic (black & white) imagery at 60-70 centimeter resolution and multispectral imagery at 2.4- and 2.8-meter resolutions.
- At this resolution, detail such as buildings and other infrastructure are easily visible.
- The imagery can be imported into remote sensing image processing software, as well as into GIS packages for analysis.
- It orbits the Earth at 280 miles altitude.







# Stormwater Utility Fee

## Residential



IA = Impervious Area

Two rate schedules:

Tier 1 = <2000 sq.ft.  
\$2.17/mo

Tier 2 = 2000+ sq.ft.  
= \$4.50/mo

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# Satellite Imagery





# Satellite/GIS Evaluation

## Residential Comparison

## Manually Digitized (drawn) Impervious Area vs. Satellite Derived impervious Area



## Total Area and Billing Classification Residential (Tier)





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# Residential Comparison

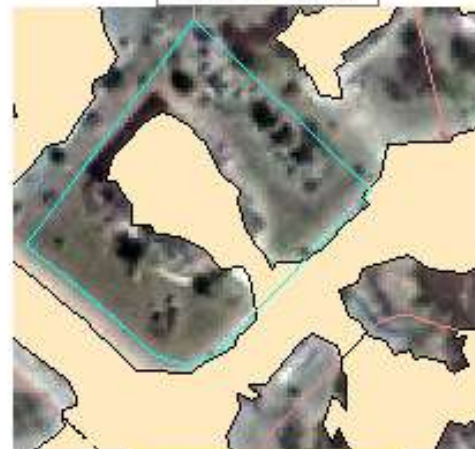
## Residential Property

Storm Water GIS



3,504 sq. ft.

QuickBird



3,030 sq. ft.

**>2,000 sq. ft. = TIER 2**

**>2,000 sq. ft. = TIER 2**

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## 2006 IA Extraction Study Area 1 Older Residential

GIS Impervious Area  
dataset (Hand digitization)  
160,199 sq. ft.

QuickBird 2006 Impervious  
Area  
(extraction)  
164,117 sq. ft.

Satellite Overestimate  
+3,918 sq. ft.  
57 Parcels

**Satellite**  
**Correctly Identified 56 out**  
**57 Parcels Billing Tier**





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## 2006 IA Extraction Study Area 2 Newer Residential



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GIS Impervious Area Dataset  
(Hand digitization)

1,067,941 sq. ft.

QuickBird 2006 Impervious  
Area  
(extraction)

1,182,399 sq. ft.

Satellite Overestimate  
+114,458 sq. ft.  
492 Parcels

**Satellite**  
**Correctly Identified 492 out**  
**492 Parcels Billing Tier**





# Residential Comparison

## Residential Tier Agreement (~48,000 Parcels)



**Number**

**Agree**

**Disagree**

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<b>Parcels:</b>	<b>47,883</b>	<b>34,505 (72%)</b>	<b>13,378 (28%)</b>
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# Comparison Summary

- **Satellite: Baseline Impervious Estimates**
- **Identification of New Impervious Area**
- **Tiers vs. Total Area**
- **Highlight Problems With Parcel Layer**
- **Highlight Issues With Billing Database**







Quickbird in visual bands



Quickbird with near infrared bands